EXECUTIVE CONTROL FUNCTION
CLOX 1

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1. Background and rationale

While the significance of dementia and marked cognitive decline for the health and functioning of older adults is well-established, the contribution of less severe deficits in cognitive function to the disabling process has received limited attention. Specifically, impairments in executive function, higher-order cognitive processes including initiation, planning, judgment, decision making, mental flexibility, regulation and self-perception, may influence physical decline through their effect on a broad range of behaviors and lifestyle factors such as, diet and eating behavior; physical, recreational, intellectual and social activity; and help-seeking and self-care practices. In a similar way, behaviors and lifestyle factors can influence age-related cognitive decline. Few longitudinal studies have been conducted in this area and all lack or have weak assessment of one or more of the following: disease, impairments and physical function; cardiovascular fitness, health behaviors, and lifestyle factors; cognitive and psychosocial function. Health ABC is strong in all these areas.

Regarding executive control function (ECF) specifically, community prevalence of impairment in ECF is unknown, but likely to be high. Measures of ECF have not been included in large-scale epidemiologic studies, due to, in part, the absence of a brief, reliable, and valid assessment method. Commonly used measures such as the MMSE do not tap ECF, and deficits in ECF are often seen in persons with intact MMSE scores. Impairment in ECF is thought to contribute to loss of independence through interference with the ability to initiate, direct, plan, and execute complex goal-directed activities, such as preparing meals, following a medication regimen, etc. Clearly, impairment in ECF could have a substantial impact on the disabling process.

Over the past several years, Donald Royall and colleagues,[1-4] have developed and field tested protocols for assessing ECF. The measure to be included in Year 5 is CLOX 1, a clock drawing test. Clock drawing is a well-established clinical tool used to screen for visuospatial and constructional disabilities. When administered and scored following the CLOX 1 criteria, the clock drawing task can help identify deficits in ECF. In addition, when spontaneous clock drawing ability is compared with copying tasks, such as the overlapping pentagons in the MMSE and 3MS, it can help discriminate cerebrovascular dementias from those of the AD type.

2. Equipment and supplies

- Plain 8 1/2" X 11" white paper
- Sharpened No. 2 pencil

3. Safety issues and exclusions

None.

4. Participant and exam room preparation

Testing should be performed in a quiet, well-illuminated room with the participant seated at a desk or table. There should not be a clock that is visible to the participant in the room.

5. Detailed measurement procedures

Place a blank white sheet of paper and pencil in front of the participant and say:

Script: *"Draw me a clock that says 1:45. Set the hands and numbers on the face so that a child could read them."*

Repeat the instructions until they are clearly understood. The words in this command have been carefully selected to influence the participant's behavior. If the participant asks a question while drawing the clock, simply repeat the instructions

"Draw me a clock that says 1:45. Put the hands and numbers on its face so that a child could read them."

However, if the participant doesn't ask any questions (even if they appear to be struggling), do not say anything.

Score each element of the clock drawing according to the criteria in the table below. Scoring should be done after the participant leaves, but on the same day, if possible.

RATING		
Organizational Elements	**Yes or No**	**Point Value (for Coordinating Center use only)**
1. Does figure resemble a clock?	○ Yes ○ No	**Yes=1**
2. Is a circular face present?	○ Yes ○ No	**Yes=1**
3. Are the dimensions >1 inch?	○ Yes ○ No	**Yes=1**
4. Are all numbers inside the perimeter?	○ Yes ○ No	**Yes=1**
5. Is there sectoring or are there tic marks?	○ Yes ○ No	**Yes=0; No=1**
6. Were 12, 6, 3, & 9 placed first?	○ Yes ○ No	**Yes=1**
7. Is the spacing intact? (Symmetry on either side of 12 o'clock and 6 o' clock?)	○ Yes ○ No	**Yes=1**
8. Were only Arabic numerals used?	○ Yes ○ No	**Yes=1**
9. Are only the numbers 1 through 12 among the numerals present?	○ Yes ○ No	**Yes=1**
*10. Is the sequence 1 through 12 intact? (No omissions or intrusions)	○ Yes ○ No	**Yes=1**
11. Are there exactly two hands present? (ignore sectoring /tic marks)	○ Yes ○ No	**Yes=1**
12. Are all hands represented as arrows?	○ Yes ○ No	**Yes=1**
13. Is the hour hand between 1 o'clock and 2 o'clock?	○ Yes ○ No	**Yes=1**
14. Is the minute hand obviously longer than the hour hand?	○ Yes ○ No	**Yes=1**
15. Are there any of the following?:		
a) hand pointing to 4 or 5 o' clock?	○ Yes ○ No	
b) "1:45" present?	○ Yes ○ No	
c) Any other notation (e.g. " 9:00")?	○ Yes ○ No	**Yes=0 No=1****
d) Any arrows point inward?	○ Yes ○ No	
e) Intrusions from "hand" or "face" present?	○ Yes ○ No	
f) Any letters, words or pictures? (e.g., feet or an alarm on the clock)	○ Yes ○ No	
TOTAL		**15**

*Note: rarely, a participant may draw a clock counterclockwise; in other words, the 11 is where the 1 should be, the 10 is where the 2 should be, and so on, all the way around the clock. In this instance, the correct response option to the question "is the sequence 1 through 12 intact?" would be "Yes."

**For Question #15: If all "No" then score 1, if any "Yes" then score 0.

6. Procedures for performing the measurements at home (if applicable)

Follow instructions for clinic administration.

7. Alert values/follow-up/reporting to participants

When testing is completed, thank the participant without offering specific feedback on their performance.

There are no alert values.

8. Quality assurance

8.1 Training requirements

The examiner requires no special qualifications or prior experience to perform this assessment. Training should include:

- Reading and studying manual
- Attending Health ABC examiner training session or observing administration by experienced examiner
- Practicing on volunteers
- Discussing problems and questions with local expert or QC officer

8.2 Certification requirements

- Completes training requirements
- Conducts exam correctly on one participant while being observed by a QC officer using the QC checklist.
- Obtains the same score as QC officer on three sample exams viewed on videotape.

8.3 Quality assurance checklist

- ☐ Exam performed in quiet, private area without interruptions
- ☐ Recites CLOX 1 instructions correctly without prompting participant
- ☐ Responses correctly coded (QC officer should independently fill out scoring sheet)
- ☐ Reviews form for completeness
- ☐ Correctly completes form

9. References

1. Royall DR, Cabello M, Polk MJ. Executive dyscontrol: An important factor affecting the level of care received by older retirees. J Am Geriatr Soc 1998;46:1-6.
2. Royall DR, Polk M. Dementias that present with and without posterior cortical features: An important clinical distinction. J Am Geriatr Soc 1998;46:98-105.
3. Royall DR, Mahurin RK, Gray KF. Bedside assessment of executive cognitive impairment: The Executive Interview. J AM Geriatr Soc 1992;40:1221-1226.
4. Royall DR, Cordes JA, Polk M. CLOX: an executive drawing task. J Neurol Neurosurg Psychiatry 1998;64:588-594.